The Efficacy of Cognitive Retraining of Attentional Deficits for a Client who has Schizophrenia

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Abstract

The purpose of this study was to assess the efficacy of the Process Specific Approach to cognitive rehabilitation for a client with schizophrenia who has attentional deficits. The study was a single case experimental design which followed a variation of the multiple baseline approach. Prior to training of the attentional deficit, multiple baseline assessments were completed. These included an overview of the subject's information processing ability, random measures of attention and a general level of functioning in living, learning and working environments. During the re-training, attention tests were administered at the completion of each attention component. A general functional evaluation through interviews and a measure of information processing ability were completed after the re-training was concluded. The results of the study demonstrate a significant improvement in attention and memory measures. Qualitative data indicate significant others observed improvements in performance in living, learning and working environments. The results suggest this approach to cognitive rehabilitation was effective with this subject and further research to establish generalizability is recommended.

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CHAPTER I

INTRODUCTION

The cognitive process of attention is a complex phenomenon which is necessary for normal functioning in everyday life. The ability to concentrate or to pay attention is a prerequisite for most other learning to occur.

Clients with schizophrenia generally demonstrate cognitive deficits, particularly in attention and memory. Traditionally, psychosocial rehabilitation assists the client in compensating for or coping with these deficits and their consequences. The acquired brain injured population demonstrate many similar types of cognitive deficits. Cognitive rehabilitation, specifically cognitive re-training, is the primary method of treatment for the brain injured population.

In the last decade cognitive rehabilitation has emerged as a specialized field of investigation and treatment. Cognitive rehabilitation refers to the therapeutic process of increasing or improving an individual's capacity to process and use incoming information so as to allow increased functioning in everyday life. Until recently, it was a treatment technique which had been used primarily with the traumatic head injury population. However, schizophrenic disorders are also characterized by abnormalities in a wide

variety of cognitive functions (Taylor & Abrams, 1984). A fundamental question is whether cognitive rehabilitation techniques used with the traumatic brain injured can be effectively applied to clients with schizophrenia.

Background to the Problem

An occupational therapist working in the mental health field frequently receives referrals which ask the occupational therapist to increase the patient's attention span and concentration. Clients with schizophrenia often describe their biggest problem as "I can't concentrate" or "my attention span is short" and this inability to attend interferes with their interpersonal relationships, their vocational hopes and dreams, and their ability to live independently. Relatives and friends describe clients as being "just not there" or "in their own world".

Increasing concentration and attention are frequently identified by the occupational therapist as goals or objectives in the treatment plan. Claudia Allen, an occupational therapist at the University of California and Los Angeles, suggests that as a profession we may have been somewhat misleading in our capability to treat cognitive deficits: that we monitor, measure, and manage an attention or concentration problem but we do not actually treat it (Allen,1985).

This study assesses the effectiveness of a treatment

technique on an attention deficit for a client who has schizophrenia.

Purpose of the Study

The purpose of the study is to assess the efficacy of cognitive rehabilitation training on a client with schizophrenia in a community-based, comprehensive psychiatric rehabilitation program. Specifically, given a client with attentional deficits, what is the impact of an attentional training program on the client's measured attention and on his/her ability to function in the world?

Rationale

There has been a minimal amount of research done in targeting rehabilitation strategies to underlying brain dysfunction. A few authors have reported remediation efforts focusing on cognitive rehabilitation with the chronic mentally ill (Diamant, 1986; Yozawitz, 1986). There is no literature identifying Canadian outpatient or inpatient cognitive rehabilitation in schizophrenia. Given the success reported with the brain injured, who often have similar deficts, this rehabilitation intervention appears to have the potential to enable clients with schizophrenia to have a better quality of life.

Research Questions

The overall research questions of this study were to assess the efficacy of this approach over a number of different areas:

1. Will the subject demonstrate increased scores on specific attention and memory measures following treatment?

2. Will the subject demonstrate increased scores on information processing measures?

3. Will the subject demonstrate an improved level of functioning in his/her living, learning, and working environments?

4. Will other cognitive processes remain stable?

Should there be a clinically significant improvement for this subject, further study will need to be done to establish efficacy for other clients with schizophrenia.

Definition of Terms

The definition of terms is included to provide a clear understanding of the concepts used in this paper.

1. Attention: the information processing capacity for selective perception.

2. Cognitive deficits: an inability to process and use information.

3. Cognitive rehabilitation: the therapeutic process of increasing an individual's capacity to process and use

incoming information so as to allow increased functioning in everyday life.

4. Disability: any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.

5. Handicap: a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfillment of a role that is normal (depending on age, sex, social, and cultural factors) for that individual.

6. Impairment: any loss or abnormality of psychological, physiological or anatomical structure or function.

7. Schizophrenia: an illness which is distinguished by characteristically disturbed ways of thinking, feeling, and relating that develop in biologically predisposed individuals under certain personal and environmental circumstances.

8. Traumatic brain injury: a brain injury resulting from a physical insult to the brain: for example, a motor vehicle accident or a cerebral vascular accident.

Outline of Subsequent Chapters

Chapter Two considers the review of the literature as it relates to theories and findings of cognitive rehabilitation. It includes a description of the illness of schizophrenia and

of the rehabilitation model. Various treatment strategies are examined including those in the acquired brain injured field. The Process Specific Approach to cognitive rehabilitation and a clinical model of attention are discussed.

Chapter Three includes the methodology of the study. The rationale for the research design is given. This chapter also looks at instrumentation, methodological assumptions, and limitations to the study.

The fourth chapter outlines the findings of the study. Results of dependent measures are graphed. Qualitative data of functional performance are described. Testing of the hypotheses is included.

Chapter Five gives a summary and brief discussion of the previous four chapters in light of the results. The results and their implications for theory, research, and practice are considered. Recommendations for further research based on the results of this study are given.

CHAPTER II

LITERATURE REVIEW

Introduction

This chapter summarizes the major findings, conclusions, and theories on cognitive retraining presently found in the literature. Moving from a general perspective of the illness of schizophrenia and the rehabilitation model, this review follows traditional and novel cognitive retraining approaches for the remediation of attention in this patient population. An overview of the literature on the retraining of attention in the acquired brain injury field is included. Specifically, the model of clinical attention and the Process Specific Approach used primarily with the brain injured population is described.

Schizophrenia

Schizophrenia is a major mental illness which affects one out of every one hundred people (Bland, 1984). Schizophrenia is described as a "major mental illness" to give recognition to the severity of the consequences of the illness on many of the people so diagnosed. It appears generally in the mid to late teens and can take several years of medical treatment and rehabilitation to be controlled.

Schizophrenia is an illness which is episodic in nature and is distinguished by characteristically disturbed ways of thinking, feeling, and relating. The illness appears to develop in biologically predisposed individuals under certain personal and environmental circumstances. Despite ongoing research, the exact cause of the disorder remains unknown.

Schizophrenia is heterogeneous by nature and has a range of courses and outcomes. Approximately fifty percent of people with schizophrenia achieve an outcome of full recovery or significant improvement (Strauss, Hafez, Lieberman & Harding, 1985). For the remaining fifty percent, schizophrenia is a chronic condition. Periods of acute schizophrenia may occur repeatedly in the course of the illness. Patients in an acute episode of the illness experience some variation of hallucinations, delusions, and thought disorder. These are the "positive symptoms" of schizophrenia as they are in addition to the person's usual repertoire of feelings. Following an acute episode, some clients experience a remission or absence of symptoms. Others enter into a lengthy chronic illness characterized by ongoing "negative symptoms". These are subtractions from the normal repertoire of feelings, such as loss of interest and energy, loss of warmth and humour, and loss of ability to feel empathy (Andreason & Olsen, 1982).

There is an extensive research literature that identifies cognitive deficits in individuals with schizophrenia

(cf. Goldstein, 1986). These deficits range over a broad spectrum of severity that impact on a person's functioning in daily life tasks and occupational roles. Characteristically, problems such as attention and memory disorders, problem-solving difficulties, and perceptual problems are evidence of underlying cognitive deficits (Levin, Yurgelin-Todd & Craft, 1989).

In summary, schizophrenia has no known causes, multiple symptoms, courses and outcomes, and is characterized by its episodic, heterogeneous nature. Individuals with chronic symptomatology and concommitant cognitive deficits have significant problems coping with societal demands and expectations.

The next section will review the literature on specific deficits of attention in schizophrenia and the impact of those deficits.

Attention Deficits in Schizophrenia

From the time of Kraeplin, a pioneer in the diagnosis of schizophrenia, attentional deficits have dominated clinical descriptions of the schizophrenic syndrome. An impairment of attention is widely accepted both as a clinical symptom and as a reflection of other cognitive deficits in schizophrenia (Levin, Yurgelin-Todd & Craft, 1989).

There are several theories as to the nature and cause of the attentional impairment. Gjerde (1983) suggests that

people with schizophrenia are unable to attend selectively to incoming stimuli. That is, they do not screen out visual or auditory "noise" but attend to all stimuli indiscriminately. Another possibility is that attentional deficits may be related to a generalized slowing of all neurocognitive functions in schizophrenia (Yates, 1966). This would result in less information being processed and, therefore, result in a limited ability to function with societal demands.

Rund (1982, 1983) found that there is a variance in attention depending on the presence or absence of paranoia. Paranoid patients were hyperattentive compared to normals but non-paranoid patients performed significantly worse than normals. Therefore, a deficit in modulating focused attention is characteristic of non-paranoid patients and not of the schizophrenic illness in general. Along the same general theme underlining the heterogeneity of the illness, Levin, Yurgelin-Todd and Craft (1989) report a number of recent studies suggesting that measures of attentional systems discriminate between schizophrenics with positive and negative symptoms particularly in regard to selective attention.

There is no neuropsychological equivalent of a blood test to determine schizophrenia or a cause of attentional deficits. However, attentional tests are markers in vulnerability studies and performances on these tests are used as evidence for differential diagnosis. For example, the Span

of Apprehension Test and the Reaction Time Crossover Test are two tests in which only clients with schizophrenia show decreased scores (Benedict & Harris, 1989).

Finally, Suddath, Christison, Torrey, Casanova and Weinberger (1990), using evidence from brain imaging studies, hypothesize that the specific brain site for schizophrenic impairment is the anterior hippocampus. This structure is believed to be the attention centre of the brain and thus would be a plausible explanation as to the cause of the deficits.

In summary, extensive reviews of cognitive research in schizophrenia (Miller, 1989) show significant information processing problems but there is no single generally accepted model of what has gone wrong in the brain. There is consensus in the literature that individuals with schizophrenia exhibit variable attention and that patients with neuropsychological deficits tend to show poor long-term social and economic adjustment (Allen, 1985).

The next section will move beyond the causes and identification of attentional impairment as the key target to the variety of treatments of the attentional deficits.

The Rehabilitation Model

The treatment of cognitive deficits and, more specifically, attention deficits in people with schizophrenia is interwoven with psychosocial and pharmacological treatment.

The current treatment of the illness of schizophrenia is directed towards the elimination of the positive symptoms, the rehabilitation of the residual or negative symptoms of the illness for the client, and the improvement of social attitudes to the illness. This paradigm is broadly reflected in the World Health Organization Model of Rehabilitation. This model suggests separate classifications of impairment, disability, and handicap.

An impairment is defined as any loss or abnormality of psychological or anatomical structure or function. Intervention at this level is described as treatment to the person. For example, medication is given to act on an organ system and reduce symptoms. A disability is any restriction or lack of ability (resulting from an impairment) to perform an activity in the manner or within the range considered normal for a human being. Intervention at this level is described as clinical rehabilitation with the person. For example, skill teaching assists the person to cope with a lack of ability.

A handicap is a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfillment of an individual's normal role because of the social response, or lack of response to the impairment or disability. Intervention at this level is environmental for the person. For example, employer education assists the person to be successful in their work

environment (World Health Organization, 1980).

This general model is the basis for the psychiatric rehabilitation approach. This approach is designed to assist persons with severe psychiatric disability to improve and normalize their level of functioning (Anthony, 1979). Psychiatric rehabilitation assumes that interventions designed to lessen a disability also lessen the handicap. It acts in collaboration with traditional interventions such as medication which are directed to the level of impairment.

In summary, the World Health Organization model suggests the impairment of structure or function can decrease a person's ability to perform some skills and activities which, in turn, can limit the person's fulfillment of particular roles.

The next section will provide a definition of attention from a functional and rehabilitation perspective.

Definition of Attention: The Rehabilitation Perspective

Attention can be described as having three hierarchical features. First, it is composed of vigilance which is a person's alertness and response to external stimuli. The second feature of attention is a person's capacity for selective perception. Thirdly, attention includes concentration or the sustained capacity for both selective perception and mental operations (Manual for Recording Care Planning, 1978).

Attention deficits are frequently encountered both in persons with major psychiatric illnesses and traumatic brain injuries. Erickson (1986), using the World Health Organization rehabilitation model, states that any cognitive deficit, including attention deficits, should be regarded as an impairment which results in a disability. That is, an attention deficit represents a loss of function which then results in a restriction or loss of ability to perform certain activities.

In summary, attention is not a simple phenomenon. A deficit in attention is an impairment at this level.

The next section will discuss the current treatment strategies and techniques for attention deficits in schizophrenia within the parameters of the rehabilitation model.

Approaches to Remediating Attention

Goldberg (1989) identifies three modern treatment methods in the area of cognitive rehabilitation of schizophrenia. The first method is the "adjustment to loss" approach. Neuropsychological assessment identifies specific cognitive strengths and deficits. The rehabilitation focus is on strengths and avoids deficit areas. For example, if clients have difficulty maintaining social conversation because of information processing problems, their vocational direction may be to work in a type of job that isolates them from other workers. This is an example of an intervention

which modifies the environment. It is a method which treats the handicap.

The second method is the "strategy-building" approach. Again, neuropsychological assessment identifies strengths and deficits and the impact of the deficit is modified by teaching coping strategies. For example, clients with memory deficits are trained in the use of a daily diary. This is an example of an intervention which modifies the client's skill level. It is a method which treats the disability.

The third method is a restorative one and can be described as the "train the brain" approach. Specific deficits are identified through neuropsychological assessment and these deficits are retrained. For example, clients with problem-solving deficits are taught the steps of problem-solving. This is an example of an intervention which modifies the actual brain deficit. It is a method which treats the impairment.

In summary, there are three basic approaches to remediation of cognitive deficits in schizophrenia. These approaches follow the general paradigm of the rehabilitation model with intervention directed towards the levels of impairment, disability, and handicap.

The next section will review the remediation of cognitive deficits using the first two approaches.

Coping and Compensation Approaches

Both the coping and compensation approaches are directed towards intervention at the level of disability or handicap. It is important to note that because of the complexity of the illness no treatment occurs in isolation of multiple other interventions.

In 1986, Erickson and Burton published an article describing a manual which combines many techniques of both coping and compensation approaches. Erickson and his colleagues are working with an in-patient population, primarily veterans, who present in increasing numbers with alcohol abuse and medical problems as well as head injuries. The focus of treatment is directed towards successful discharge to the community. The authors suggest that regardless of the cause of the cognitive deficits, these deficits still result in functional impairment. The manual includes specific, concrete directions for staff, students, family members, community caregivers and the patient. Many of the suggestions have been borrowed from the work done with the acquired brain injured population.

Although the manual recognizes the presence of an impairment, the techniques do not treat it. Rather, the techniques are treating the consequences of the impairment. The manual provides compensation and coping techniques and does not make any attempt to restore function. Erickson

(1988) continues to acknowledge the need for remediating cognitive deficits for psychiatric clients. He suggests that cognitive rehabilitation programs, for persons with severe psychiatric disability, be informed by the practices of those working with persons who are brain-injured. The necessity of improving the specificity of treatment for cognitive deficits of long-term psychiatric patients is emphasized.

Cognitive therapy approaches the problem from a somewhat different angle. Meichenbaum and Cameron (1973) used cognitive therapy techniques such as self-talk and disputing irrational beliefs in an attempt to reduce thought disorder and improve attention with schizophrenics. Treatment was directed towards the psychotic cognitions. The study reports some limited success, using a method which is a compensatory one.

Kingdon (1990), a clinical psychiatrist from a teaching hospital in England, presented a paper at the Schizophrenia '90: Poised for Discovery conference in Vancouver. He suggests the cognitive-behavioural therapies provide a helpful structure to mobilize rational argument in relating psychologically understandable beliefs to psychotic phenomena. For example, clients who experience hallucinations are encouraged to look for rational possibilities as to the cause of the hallucinations, such as lack of sleep. Once clients understand the psychotic symptom may have an actual reason behind it, their anxiety is decreased and their ability to

cope with the symptom increases. Treatment is directed towards rational arguments for psychotic conditions and provides a schema for coping with the illness by clients and their families.

A pilot research study by Stein (cited in Stein, 1990) used cognitive behavioural techniques. The treatment protocol was based on a psychoeducational model that applies a supportive learning environment to foster patient knowledge and self-regulating of symptoms. Preliminary data indicate that a cognitive behavioural treatment program can be helpful in decreasing anxiety and in helping psychiatric patients cope more effectively with stress. This treatment is primarily a coping method.

In summary, the coping and compensatory approaches direct their interventions towards the levels of disability and handicap and, in general, modify the cognitions or the consequences of the deficits. The cognitive behavioural interventions focus on changing psychotic conditions and resulting anxiety. The underlying cognitive processes are not targeted.

The next section will discuss the restorative method.

Retraining Approaches

The restorative methods, although employed for many years with the acquired brain injured population, have only recently been seen as a treatment of choice for chronic

psychiatric patients. Nevertheless, it is a novel and interesting approach and recent literature indicates it has the potential to be successful.

In the Netherlands, Diamant (1986) describes a program in which systematic co-ordination and integration of different training procedures are utilized to improve cognitive dysfunction. The interventions begin in the laboratory and are generalized to real life work and play situations. Microcomputers seem to be the primary laboratory tool. However, all instruments and all significant people participating in the training program provide rewards and feedback. Approximately thirty-five patients have completed the entire program.

The author makes a number of recommendations on the procedures. It is suggested that no more than two cognitive functions should be trained at any given time and two cognitive functions need to be maintained as control functions. Both of these should be assessed on a regular basis. The accent of the training should be on the qualitative aspects of the treatment. Over the course of the program they have also improved their training techniques and now give more attention to the emotional and motivational factors rather than the actual concrete re-training. There are also certain indications and contraindications for training of cognitive functions with psychiatric patients.

It is unclear exactly how they are training clients and,

in this paper, they do not report results from their thirty-five completed subjects. However, Diamant has published three other papers on this program which are only available in Dutch. This paper reflects the establishment of some basic principles of cognitive rehabilitation for long-term psychiatric clients.

Magaro, Johnson and Boring (1986) reviewed the literature which focused on the treatment of schizophrenia through the modification of cognitive processes. Steffy and Galbraith, 1980, Kaplan, 1974 and Wagner, 1968 (cited in Magaro, Johnson & Boring, 1986) have found improvements in the identified deficit to be related to preliminary training, positive urging and support by the examiner. It appears that training of attending skills and improvement in attentional deficits are amenable to change if positive reinforcement is introduced into the task by way of increased contact with the tester. It is not clear whether the positive effects of the interaction with the trainer or the actual training or some combination thereof result in the improved attention. However, it is evident that attentional deficits can be changed.

Benedict and Harris (1989) completed a study of training attention in chronic schizophrenic patients in which attention by the tester was controlled. This study compares three groups of twenty patients including an experimental treatment group, an attention-placebo group, and a no treatment control

group. The results demonstrated significant improvement in the experimental group at the $p < 0.001$ level. This appears to be the only study that controls for experimenter attention.

Another study (Adams, Malatesta, Turkat & Brantley, 1981) reported that improved attention, measured by tests, was further reflected in a clinical improvement. This case study reported a multi-faceted treatment program directed towards improving the client's attending and focusing skills. It included the mechanics of attending, attention training tasks with or without auditory, visual, conversational and interpersonal distraction and attending to appropriate internal stimuli. Self-report and the report of significant others indicated improved conversational abilities, attainment of a part-time job, and decreased depression. Test scores improved and were maintained over a six-month period. The study suggests interventions must be directed at the processes themselves and not at specific cognitions resulting from impaired processes.

This particular study did have a methodological flaw. The client was trained using the same attention tasks as the pre and post attention tests. The improved scores could then be a reflection of user familiarity. However, it is one of the few studies which reports any improvement in the client's life situation.

Olbrich and Mussgay (1990) found that in a clinical con-

trolled trial, training was shown to be effective with regard to more complex cognitive functions rather than on an elementary level. They suggest that this reflects the development of compensatory mechanisms. If this is in fact the case, perhaps current training programs may not restore a deficient repertoire but assist in learning novel cognitive strategies. Identifying compensatory strategies and training techniques to promote them may be a future direction in this area (Olbrich & Mussgay, 1990).

This study does have limitations. It was carried out over a period of only three weeks with patients in an acute psychotic state. It is not surprising that a re-integration of higher cognitive functions was seen in this period as the patients recovered. Given that attentional deficits are of a chronic nature and longstanding duration, one explanation for the lack of change in elementary deficits is that the study was not long enough to make an impact on these deficits.

A group from the University of Rochester (Miran, Miran, Tirrell & Mudholker, 1990) presented some preliminary findings at the American Psychological Association in Boston. They are using cognitive retraining strategies directed towards frontal lobe functions such as problem-solving, judgement, and mood control. They work primarily with groups of clients doing applied clinical treatment.

Yozawitz, Charters, Iskander and Reiter (1985) suggest

that the premorbid cognitive deficits of psychiatric patients may not be fixed. Premorbid cognitive deficits are those deficits evident prior to a psychiatric diagnosis and would include learning disabilities and developmental perceptual disorders. This paper proposes a model for treatment whereby training of cognitive deficits is essential and necessary to clients prior to active skill and environmental training. A small sample of clients (n=6) were compared across neuropsychological indices. One group received individualized cognitive habilitation training in addition to the traditional training and activities of daily living (ADL). The control group received ADL treatment only. The experimental group showed improvement which was specific to information processing skills. There was no significant evidence of improved clinical functioning on blind rating of chart vignettes which suggests that generalization did not occur. However, it was recommended that further longitudinal study to assess clinical outcome is required. Yozawitz (1986) suggests that cognitive rehabilitation is the treatment of choice, following medication, for those clients with premorbid cognitive difficulties.

To date, the studies reviewed show various limitations. These include: measures which test attention being used to train attention; anecdotal evidence reported as fact; no control tasks used to discriminate the process actually being trained; and generalization measures being limited or non-

existent. However, it does seem possible that the attentional deficits thought to characterize schizophrenic patients are not irreversible. In fact, it appears that by tailoring training to fit the specific deficit, it may be possible to alter these deficits in a positive manner and in some cases eliminate them.

Similarities between psychiatric clients with cognitive deficits and the traumatic brain injured is reflected throughout the literature. Yet there are differences between the two populations. The brain injured have an actual identifiable lesion to their brain. Schizophrenia is a working diagnosis which suggests brain level dysfunction. Certainly, brain imaging studies (Suddath, Christison, Torrey, Casanove, & Weinberger, 1990) propose the anterior hippocampus as a lesion site in the brain of schizophrenics. However, they also suggest that it is possible that schizophrenics have a brain deficit that has not yet been identified. The review of the literature concerning retraining attention for the acquired brain injured will be discussed in a later section.

In the next section, the theoretical basis of the Process Specific Approach to cognitive rehabilitation will be discussed.

Cognitive Rehabilitation: The Process Specific Approach

Cognitive rehabilitation refers to the therapeutic

process of increasing or improving an individual's capacity to process and use incoming information thereby improving everyday functioning. This includes both methods to restore function and methods to compensate for "lost or unrestoreable" functions.

The Process Specific Approach describes a method whereby each specific step of the information processing paradigm is assessed and treated individually if a deficit is evident. All interventions are directed towards the specific deficit. It is different from a general stimulation approach where all aspects of information processing are stimulated at the same time.

Sohlberg and Mateer (1989) outline six fundamental rehabilitation principles of the Process Specific Approach:

1. Each cognitive process area is defined by a theoretically based model;

2. Therapy tasks are administered repetitively;

3. Goals and objectives are hierarchically organized;

4. Remediation involves data based and directed treatment;

5. The use of generalization probes provides measurements of treatment success; and

6. Ultimate measures of success must be improvement in the level of vocational ability and independent living. This particular model is essentially a restorative model in that

intervention and treatment are directed towards reducing impairment and restoring function.

There are some basic assumptions in the model. All tasks target the same component of a cognitive process. It is thought that direct retraining of cognitive processes can result in a reorganization of higher level thought processes (Luria, 1973). Tasks are administered in a hierarchy ranging from simple to complex within the same cognitive component. This provides ongoing stimulation and challenge to the cognitive processes. Treatment is directed by data gathered on the daily task. Generalization must be measured at three levels: within and across therapy sessions, on different neuropsychological tests containing similar cognitive requirements, and in increased functioning in day to day living (Sohlberg & Mateer, 1989). Although Sohlberg and Mateer apply these principles to all aspects of cognitive deficits, this paper will only review their clinical model of attention.

Clinical Model of Attention

Attention is a multi-faceted, multi-layered complex phenomenon. It is the second basic essential cognitive function in the information processing hierarchy following orientation. Without orientation ability (that is, awareness of person, place,time and life context), attention is meaningless. However, attention itself then becomes necess-

ary, but not sufficient, for all increasingly more complex cognitive functions such as memory, problem-solving, and other executive functions. The implications of an attentional disorder can be seen to then have an influence on the majority of frontal lobe functions. Sohlberg and Mateer (1989) suggest that attention is a multi-dimensional cognitive capacity critical to memory, new learning, and all other aspects of cognition.

The treatment model includes five separate hierarchical levels of attention.

1. Focused attention: This is the ability to respond discretely to specific visual, auditory or tactile stimuli. This level of attention is required for a person to be awake and oriented to person, time, and place.

2. Sustained attention: This refers to the ability to maintain a consistent behavioural response during continuous and repetitive activity. It suggests a conformity of performance and includes the notion of mental control.

3. Selective attention: This refers to the ability to maintain a behavioural or cognitive set in the face of distracting or competing stimuli. This particular concept of distractability includes both external visual, auditory, and kinesthetic noise as well as internal distractions such as worries and preoccupations.

4. Alternating attention: Whereas the previous level refers to one's ability to maintain a cognitive set, this

level refers to a capacity for mental flexibility that allows individuals to shift their focus of attention and move with fluidity between tasks.

5. Divided attention: This level requires the ability to respond simultaneously to multiple tasks or complex task demands. It includes both multiple responses and multiple stimuli. The concept of divided attention refers to types of flexibility in attention processes. This flexibility may be between unconscious automatic processing or rapid and continuous alternating attention (Sohlberg & Mateer, 1989).

This model of attention meets the criteria for cognitive rehabilitation using the Process Specific Approach. It has been demonstrated to be effective for the acquired brain injured using multiple replication (n=1) single-case experimental studies (Sohlberg & Mateer, 1987).

The next section will review the treatment of attention deficits in the acquired brain injured population.

Remediation of Attention Deficits in the Acquired Brain Injured

The similarity between the cognitive deficits for subgroups of clients with schizophrenia and acquired brain injury are reflected throughout the literature (Erickson, 1986; Diamant, 1985; Yozawitz, 1985; Allen, 1985; Magaro, Johnson & Boring, 1986). Many of these authors suggest that techniques for treatment can and should be borrowed from the

acquired brain injured rehabilitation field.

Benedict (1989) reviewed the literature concerning the effectiveness of cognitive remediation strategies for victims of traumatic brain injury. This paper will only review those studies discussing remediation of attentional deficits. The article reviewed six studies, all of which were single-case experimental design. Of these studies, the most promising intervention thus far has been Sohlberg and Mateer's hierarchical approach to attention retraining. Their study included an adequate baseline assessment to establish performance over time prior to retraining, a discriminating task to identify which process was actually being trained, and a variation in multiple replication studies demonstrating marginal improvement in untrained processes and significant improvement in the specific process being trained.

In the other studies, Benedict reports numerous methodological inadequacies which prevent the identification and isolation of specific treatment effects. Many of the reviewed studies did not include an adequate pre-treatment baseline or employ reliable and standardized assesssment devices. The studies in general reflect a lack of congruence between the cognitive deficits which were trained and the assessments which were administered to measure improvement.

Summary

The Process Specific Approach is a theoretical basis for the intervention of cognitive re-training of attention with the acquired brain injured. There are many similarities between this population and schizophrenia. Attentional deficits result in functional limitations for clients with schizophrenia. The rehabilitation model provides a framework for understanding levels of intervention and the treatment of these deficits. There appears to be some evidence in the literature that suggests these deficits can be re-trained.

The purpose of this study is to assess the efficacy of the Process Specific Approach to cognitive rehabilitation for a client with schizophrenia who has attentional deficits. The next chapter will present the methodology of the study.

CHAPTER THREE

METHODOLOGY

This chapter consists of a description of the research methodology including the research design, sample and population, instrumentation and data collection, and recording. It also includes a discussion of the data analysis, methodological assumptions and the limitations of the study.

Research Methodology: The Single-Case Experimental Design

The study followed a single-case experimental design. This particular design was chosen because it has some clear advantages in examining behaviour change in individuals over time. McReynolds and Thompson (1986) identify three technical advantages to single case experimental designs.

The first advantage is their usefulness in identifying functional relationships between independent and dependent variables. Treatment is introduced while other variables are held constant. This allows the treatment to be isolated as the intervention in order to determine the effect of the treatment on the behaviour.

Secondly, the single-case experimental design allows for inter-subject variability. In this study clients with schizophrenia differ in both the nature and degree of

impairment and they may also vary in how they respond to a treatment technique. Initially a relationship is demonstrated between treatment and cognitive ability in a single subject. Generalizability is then established through multiple replications.

Thirdly, the single-case experimental design allows for natural variability within a subject including the identified behaviour prior to treatment. In this way the treatment can be modified to the unique needs of the subject as necessary (McReynolds & Thompson, 1986).

The design is individually based and involves repeated measures over time. This follows the natural pattern of rehabilitation in the clinical setting. Initially a baseline is established which is used to predict the behaviour of the dependent variable if there is no intervention. Then treatment is introduced and its effect can be observed. Sohlberg and Mateer (1989) identify some practical advantages to this design. These advantages are: objective data on the effects of a clinical intervention are produced; it is appropriate to clinical settings; and it is sensitive to the unique aspects of each individual case.

Kazdin (1984) suggests single subject designs are vulnerable to threats to their external validity. The behaviour may change as a result of the subject's and investigator's awareness independent, of the treatment. A particular subject may be more responsive to the treatment as

a result of the unique interaction between the treatment and the subject. It may not be possible to discriminate between multiple treatments. All these threats to external validity can be decreased by careful description and documentation (Kazdin, 1984).

There are many types of single-case experimental design. This study utilized a variation of a multiple baseline design. This particular type of design does not require the withdrawal of treatment and allows the effects of a single treatment on different behaviours to be seen.

In summary, single-case experimental design is an established method of applied clinical research which allows for the heterogeneity of a population. It includes ongoing modification and observation of treatment which is documented to give a complete description of the subject. Therefore, other clinicians can compare that subject with their own client and make a decision around treatment. The baseline demonstrates performance without treatment and allows for comparison of performance with treatment. Lastly, the design allows for clinical as well as statistical significance.

Research Design

The research protocol is described in Figure 1. The independent variable is the treatment technique of attention re-training. The treatment consisted of the Attention Process Training (APT) kit developed by Sohlberg and Mateer

Figure 1 Single Case Experimental Design

TIME PERIOD	PRE-TRAINING	BASELINE 4 weeks	TRAINING 24 Weeks	POST-TRAINING
PURPOSE	1.assess suitability of subject	1.obtain baseline information 2.accustom client to trainer and schedule 3.develop rapport	Administration of Attention Process Training Sustained Selective Alternating Divided	Evaluation
		Week 1__2__3__4	Week 1_____9_____15_____17_____24	
TESTS ADMINISTERED				
Halstead-Reitan Battery	X	.....	.....	.....X..
ATTENTION MEASURES				
Rey Figure	X.....	.....	.....X.....X.....X.....	.....X..
PASAT	.....X...X.....	.....	.....X.....X.....X.....	.....X..
Selective Reminding Test	.....X..X.....	.....	.....X.....X.....X.....	.....X..
Spatial Relations	.....X..X.....	.....	.....X.....X.....X.....	.....X.
CLINICAL MEASURES				
Mental Status Exam or	.....X.....	.....	.....X.....	.....X.
In Situ Interviews (living, learning & working	.....X.....	.....	.....	.....X.

(1986), administered by the principal investigator. The training protocol follows graduated learning steps from simple to more complex levels of attention processing, using audiotaped and written exercises.

The dependent variables are the subject's cognitive ability of attention and the subject's ability to function in his/her living, learning and working environments.

There are four hypotheses generated from the problem statement. Following the treatment:

1. The subject will demonstrate an increase in scores on attention and memory measures (PASAT, Selective Reminding Test, Rey Figure) compared to baseline levels.

2. The subject will demonstrate an increase in the attention and memory subtests of the Halstead-Reitan Test Battery, indicating an improvement in information processing ability, compared to pre-treatment scores.

3. Clinical reports of level of functioning will demonstrate improvement in the subject's living, learning and working environments compared to pre-treatment reports.

4. There will be no improvements on the Spatial Relations Test compared to the baseline. That is, attention re-training will not produce changes in other cognitive abilities, such as visual processing, as measured by the Spatial Relations Test.

Selection of Subjects

The research setting is a community based, psychiatric rehabilitation program which provides long-term, supportive care for young adults with schizophrenia. The program is located in the downtown core of an urban industrial centre (population, 350,000) in southern Ontario. The mandate of the program is to increase the quality of life of the person with schizophrenia and to reduce the burden on the family.

A potential pool of subjects was generated by the case managers in collaboration with the neuropsychologist. Subjects were screened out if they were acutely psychotic or in the hospital at the time of the preliminary testing or if there was no evidence of an attentional deficit on neuropsychological testing. Subjects were also required to be medically and pharmacologically stable at the onset of the study and, as much as possible, were expected to maintain constant living, learning and working environments for the duration of the study. Given the unpredictable nature of the illness, two subjects were selected in case of attrition due to onset of acute symptoms. The completion of a second subject would strengthen the design by providing external validity through lateral replication.

Instrumentation

A comprehensive battery of neurocognitive tests was used to gather data measuring information processing, attention and memory, and spatial relations. The repeated measures are relatively brief, taking ten to fifteen minutes to complete. This reduces the possibility of fatigue or stress due to extended effort in testing. Two of the instruments have norms for both the normal population and for schizophrenics. Therefore, the subject's score can be compared to both populations.

Information Processing Battery

The Halstead-Reitan Neuropsychological Test Battery (HRNTB) (Reitan & Wolfson, 1985) consists of a number of subtests which provided an overall appraisal of the subject's cognitive functioning and information processing. Tests specific to attention and memory are the Seashore Rhythm Test, the Trail Making Test, and the Speech-Sounds Perception Test. Traditionally, the Wechsler Memory Scale is included in the battery to measure memory impairment. It is considered to be an adjunct to the HRNTB and is used specifically to measure memory capacity. The Wechsler Memory Scale has been demonstrated to have construct validity for the broad, general dimension of memory function (Zagar, Arbit, Stuckey & Wengel, 1984).

A measure of general intelligence is also included.

The Shipley Institue of Living Scale is a brief, useful test which gives a quick, yet accurate, measure of general intellectual functioning (Zachary, 1985). It is included from the clinical record to provide a baseline of general intellect.

Reliability. Klonoff, Fibiger and Hutton (1970) state reliability measures obtained using a test-retest technique indicate the HRNTB is highly reliable. Subjects (n=35) with chronic schizophrenia were tested and re-tested after a twelve month interval. Overall the reliability was found to be substantial with the exception of the tactual performance memory and location tests (r=.63, r=.49). These reliability co-efficients, although weak, were significant at $p<.01$. All other tests demonstrated a range from r=.72 to r=.84. Split half reliability of the category test was found to be .90 and this compares with Shaw (1966) who found split half reliability of the category test to be .98 with brain damaged adults. Two subtests, the Trails B and the sentence completion test, discriminated between the group with the neurological deficit and the neurologically intact.

Jarvis and Barth (1984) report reliability measures for accuracy of classification along the dimensions of presence, chronicity, and laterality of brain damage between inexperienced clinicians and computerized interpretations of data are highly correlated (r=.95).

Validity. Meier (1985), in a review of the HRNTB, states a

normative base for establishing a profile of individual standard scores can be found in a large collection of studies designed to demonstrate the validity of the battery to differentiate:

1. organic neurological from normals
2. organic neurological from functional psychiatric
3. focal from diffuse neurological disease
4. regional focal cerebral dysfunctions and major zones
5. etiological conditions associated with individual differences in outcome patterns.

The development of the battery compared control subjects to persons known to have brain damage and in this way identified the tests which were sensitive to the general condition of the brain. There are multiple studies documenting efficacy in the literature (cf. Boll, Heaton & Reitan, 1974). The validity of the neuropsychological measurements in a number of clinical conditions has been researched extensively (Reitan & Wolfson, 1985).

Another review of the HRNTB (Dean, 1982) states the validity of the battery has come from research involving the "clinical blind" technique. Administration and interpretation of test results is done without knowledge of the patient's case history or present diagnosis. Test results are compared to independently determined neurological information from radiological or surgical means.

Predictive validity is established using the impairment

index. Cutoff scores indicate the presence of impairment. The test discriminates normal controls from brain damaged subjects with considerable accuracy (84-98%). This index is most sensitive to the general prediction of brain damage (Dean, 1985). Reitan (1964) carried out a predictive validity study with highly remarkable results (over 98% accuracy). Nevertheless, this has never been replicated by another clinician.

Criticism and Support. The test manual reports no standardization or normative data but relies on a body of research which has evolved over the last forty years. There is a lack of comprehensive evaluation of the effectiveness with which the battery is applied.

However, Meier (1985) suggests it remains the most widely used and most extensively validated approach to distinguish cognitive deficts. He underlines that it must be administered and interpreted by a highly trained and experienced neuropsychologist. He also predicts it will need to undergo further modification and revision with the advancement of modern brain scanning techniques. Dean (1985) also suggests the interpretation of the battery relies more on the training of the professional in neuropsychology than the development and standardization of specific subscales. Finally, Jarvis and Barth (1984) state the HRNTB more clearly and consistently demonstrates brain-behaviour relationships than any other battery and is by far the most validated and

standardized.

Although it is a lengthy test battery, it was used in this study because it is part of the ongoing clinical assessment for the clients in the program. Therefore, test results which have been administered by the same neuropsychologist are available over a long period of time.

Instruments Measuring Attention

The Selective Reminding Test

This test is a verbal auditory measure of attention and memory. It is a simple method or technique that is clinically useful for analysing impaired memory and learning (Buschke, 1973). It distinguishes list learning from item learning and allows for analysis of storage, retention, retrieval, and recall functions (Buschke & Fuld, 1974).

A list of twelve words is spoken at the rate of one every two seconds. The subject is requested to recall the word lists until all twelve are recalled or until twelve trials are completed (see Appendix One). The subject is reminded only of the words they omitted and are then required to recall all the words on the list. Upon completion of the recall section, the subject is asked to complete a recognition task. The subject must choose the correct word from the recall list which is embedded in a group including a synonym, a homonym, an unrelated item, and the exact word.

Reliability. Ruff, Quayhagen and Light (1988)

demonstrated test-retest reliability after a six month interval. All subjects were tested with Form 1 initially, and Form 2 the second time. They found a significant correlation between the two forms on Total Sum of Recall ($r=.73$, $p<.001$) and Total Consistent Long-term Recall ($r=.66$, $p<.001$). They also found significant differences between men and women in test performance. Form 2 appeared to be less difficult than Form 1.

Hannay and Levin (1985) found test-retest reliability, while highly significant, was somewhat lower than the level generally acceptable for psychological tests. Indices of consistency ranged from $r=.48$ to $r=.65$. They also described an order effect in that the first test administered resulted in a poorer performance than subsequent tests. Form 1 of the test was more difficult than Forms 2,3, or 4. Men also had significantly more intrusions than women.

A study of normal and demented elderly (Masur, Fuld, Blau, Thal, Levin & Aronson, 1989) established test-retest reliability using Spearman correlations of .84 for long-term retrieval, .89 for sum of recall and .92 for consistent retrieval.

Validity. Concurrent measures did not relate to verbal I.Q., immediate attention, and verbal memory in a study by Ruff, Quayhagen and Light (1988). They also suggested that success in the task appeared to be related to the utilization of strategies. Another group of researchers (Goldberg,

Weinberger, Pliskin, Berman & Podd, 1989) found the Selective Reminding Test correlated weakly with the Mini Mental State Exam ($r=.41$, $p<.02$) and the anergia syndrome of the Brief Psychiatric Rating Scale. Grand recall correlated with the anergia syndrome at $r=.54$, $p<.01$, grand long-term storage correlated at $r=.53$, $p<.01$.

In a study of concurrent validity (Macartney-Filgate & Vriezen, 1988), the Selective Reminding Test was correlated with the Wechsler Memory Scale and the Rey Auditory Verbal Learning Test. The Selective Reminding Test demonstrated correlational co-efficients from $r=.51$ to $r=.78$ on all items of the Wechsler Memory Scale except the Easy Associate Learning items. Although these items demonstrated significance ($r=.40$, $p<.05$), the relationships are moderate among all measures and weak on Easy Associate Learning items and Trial Six of the Rey Auditory Verbal Learning Test. The authors suggest the Selective Reminding Test may be a more demanding test than the other two. Because of the moderate correlations between the tests, the article concludes that it may be necessary to use a number of tests to assess verbal memory. Lezak (1983) also confirms the need for more than one technique to evaluate attention and memory functions.

Predictive validity was shown in a study by Masur et al. (1989) to range from 86% to 100% in distinguishing normal from demented elderly.

Criticism and Support. There does appear to be test-

retest reliability, with some discrepancies between forms of the test. The test does become unique to the individual taking the test and it is possible certain words may be more significant to one person than another, therefore, increasing or decreasing performance depending on the connotation of the word for that person.

However, the Selective Reminding Test does provide a measure of a number of aspects of verbal memory, not just total number of words recalled. It also has been normed for the schizophrenic population.

The Paced Auditory Serial Addition Task (PASAT)

This test is a numerical auditory measure of attention. It is a neuropsychological test which is sensitive to deficts in information processing ability (Gronwall, 1977). The test consists of a taped list of numbers which the subject is asked to add and give the answer aloud. Numbers are presented at a standard time interval progressively increasing in speed. The subject adds each number to the one just before it, not the answer of the previous pair (see Appendix Two).

The PASAT specifically measures the rate at which information presented to the mind can be processed. It provides a numerical score of the amount of information that can be handled at one time by an individual (Gronwall & Wrightson, 1975).

Reliability. There are no available correlation co-

efficients for reliability. However, Gronwall and Wrightson (1975) state it is useful for heterogeneous groups because inter-test variations are small and, therefore, it allows comparisons to be made between successive tests. One of the earliest studies of the PASAT (Sampson, 1956) found no significant differences on test performances by different cohorts. There is a significant practice effect between first and second administrations of the test but following the second administration, further practice results in negligible improvement (Gronwall, 1977).

The test is given in a taped presentation at four different rates of speed, following a practice trial. This standardized protocol eliminates variation in the test administration and reduces tester error.

Validity. Although the test, itself, appears complex and mathematical in nature, Sampson found it insignificantly correlated with mathematical ability (r=.24) and general intelligence (r=.28) (cited in Gronwall & Sampson, 1974).

The reduction in the information processing rate correlated significantly with subjective reports of complaints in attention and concentration and with performance on practical rehabilitation programs for post-concussion patients (Gronwall & Wrightson, 1977). This suggests the PASAT provides a measure of functional performance. In support of this, Lezak (1983) states by using the PASAT as an indicator of the efficiency of

information processing, the test can predict when the patient is able to return to a normal level of vocational activity. A number of sources cite the PASAT as a sensitive measure of information processing (Lezak, 1983; Sohlberg & Mateer, 1987; Gronwall, 1977).

Criticism and Support. The absence of correlation coefficients reduces the robustness of the reliability and validity data. However, it is a test which is demonstrated to measure not only attention and information processing but is used to predict functional performance. It is always given in the same standardized format.

The test, itself, has some practical advantages. It is brief to administer, yet provides objective quantitative data. The norms and standard deviations of the task are well documented with normal individuals.

The Rey-Osterrieth Complex Figure

This test is a measure of figural attention (Loring, Martin & Meador, 1990). Subjects are asked to copy the figure (see Appendix Three). The figure is then removed and the subject is asked to reproduce the figure as accurately as possible.

Reliability. Loring, Martin and Meador (1990), using a scoring guideline included in the article, report significant inter-rater agreement for delayed recall of the Rey Figure (r=.98). Immediate copy of the figure was not measured for inter-rater reliability as over 95% of the subjects scored

100% in the task. The authors conclude the formal scoring criteria can be reliably applied by independent raters.

Validity. Concurrent validity with the Taylor Complex Figure is reflected by the similarity of the scores obtained on tests (Lezak, 1983). The norms of the test have also been documented, following a 45 minute recall, for subjects with schizophrenia. These subjects scored 10.8 out of the possible 36 points ($t=7.2$, $p<.01$) (Kolb & Whishaw, 1983). Loring, Meador and Martin (1990) also established norms and standard deviations for normals following a 30 second recall.

Criticism and Support. The Rey Figure has excellent inter-rater reliability on scoring and has been shown to discriminate between schizophrenics and normals. However, its method of administration is variable and can range from a 30 second recall to a 45 minute delayed recall. It appears that immediate recall provides an indication of immediate attention and short-term memory and these norms are used in this study. The single subject's scores can then be compared to the normal population.

The Spatial Relations Subtest (Woodcock-Johnson Psychoeducational Battery, 1977)

This test requires the subject to identify which of two or more discrete figures, if turned, would fit together to form a whole target figure. This test is a measure of spatial relations and is included to discriminate the treatment effect from the re-training and the specific

process being re-trained. See Appendix Four for an example of the task.

Reliability. The Woodcock-Johnson Psycho-educational Battery was developed over a period of years with considerable pilot testing, item analysis, and item editing. The twelve subtest cognitive scale, which includes the Spatial Relations subtest, has corrected split half reliability co-efficients of .96 to .98 for ages five to sixty-five. The Broad Cognitive Scale includes verbal, reasoning, perceptual-speed and memory tests with a range of r=.70 to r=.90. Kaufman (1985) reports that subtest reliabilities over all scales are outstanding with median co-efficients of .80 to .95. Cummings (1985) also reports test-retest stability for the Spatial Relations subtest.

Validity. The Spatial Relations subtest has good face validity. Concurrent validity data were obtained with the Stanford-Binet Intelligence Test, the Weschler Adult Intelligence Scale-Revised (WAIS-R), and the Wide Range Achievement Test (WRAT). The cognitive portion of the battery has a .83 correlation co-efficient with the WAIS-R.

In a review of the battery, Kaufman (1985) reports that criterion related validity studies have been done for normal children and adults as well as for special populations. He also states the construct validity for some parts of the entire test are weak. However, he does not identify which of these subtests are weak.

Criticism and Support. In general, specific measures of validity are not given for each subtest. The tests are clustered for scoring into distinct scales so that validity is given for the cognitive scale, which includes the Spatial Relations subtest of the battery. Nevertheless, the Spatial Relations subtest demonstrates good reliability, face and construct validity. It also has been used to discriminate the impact of attention training from other cognitive abilities (Sohlberg & Mateer, 1987).

Treatment

The retraining itself was accomplished using the Attention Process Training Kit developed by Sohlberg and Mateer (1986) for the acquired brain injured. It includes an Attention Proceess Training Manual, the theoretical background for a five level model of attention, and descriptions of over fifty separate attention treatment activities hierarchically referenced to the theoretical model. Detailed administration procedures are given. The kit also contains nineteen cassette tapes, thirteen visual stimulus sheets, visual distractor overlays, re-usable overlays, a response buzzer, stopwatch, and a carrying case.

The training kit assumes the client has focused attention skills. Training begins at the level of sustained attention. This is the second level of the hierarchy in the clinical model of attention. Performance on tasks was

measured using scoresheets and graphs (see Appendix Five). All actual tasks were marked and retained. Environmental influences, such as week-ends home or interpersonal problems were documented on the scoresheets. The investigator was not responsible for the case management of the subject, but did maintain an ongoing liason with the subject's case manager.

The subject completed each task with 100% accuracy before moving on to the next task in the hierarchy. The exercises began with very simple tasks such as "Cross out all the circles", and increased in complexity to tasks such as "Press the buzzer when the month you hear is just before the one you just heard". Each section added a different aspect of attention but ranged through simple to complex tasks (see Appendix Six for examples of tasks).

Data Collection and Recording

In the preliminary phase of the study the research committee of the agency was approached for consent to use the field. Once this was given, the Ethics Committee at the regional psychiatric hospital gave consent following submission of the proposal. This committee is used by the agency to provide objective ethical consent for research undertaken at this agency. The subjects were approached by the author and the purpose of the study was reviewed. The subject's case manager was present at the interview. Two subjects agreed to participate in the study. Written consent

was obtained (see Appendix Nine). One subject completed the re-training program within the time limitations of this study. The second subject continues in the re-training.

The assessment phase of the study took approximately two months to complete. Initially, the Halstead-Reitan Test Battery was administered by the neuropsychologist to confirm the presence of an attentional deficit. The Rey-Osterrieth Figure was included in this testing. After completion of this battery, the PASAT, the Selective Reminding Test and the Spatial Relations subtest were administered at least twice over a four week period. The primary investigator under the supervision of the neuropsychologist administered these tests. They were scored by the neuropsychologist with the exception of the Rey Figure. It was scored throughout the study period by a clinical nurse specialist with expertise in the scoring.

The subject's case manager did a formal mental status exam and this was documented in the clinical record. The author interviewed the subject's parents and employer to gather anecdotal information on how the subject was functioning in those environments and this was documented on the clinical record (see Appendices Seven and Eight).

The subject received two to three cognitive re-training sessions per week, averaging one hour in length. The training period included nine weeks in the sustained attention component, six weeks in the selective attention

component, two weeks in the alternating attention component, and six weeks in the divided attention component. In addition to cognitive remediation, the subject continued to receive concurrent intervention in daily living, vocational, and psychosocial areas.

At the completion of all exercises within each section the PASAT, the Selective Reminding test, the Rey-Osterrieth Figure, and the Spatial Relations subtest were administered. Raw scores were converted to z-scores for the PASAT and the Rey Figure. This transformation of raw scores to z-scores is referred to as a linear transformation. It is derived by converting an individual score to the number of standard deviation units that the score falls above or below the mean of the distribution.

At the conclusion of all the sections of the re-training, only the attention and memory subtests of the Halstead-Reitan battery were given. Interviews with the subject's parents and employer were carried out. Anecdotal reports from other significant people were included in the documentation.

Data Processing and Analysis

Data included a pre and post treatment administration of the HRNTB. Scores for the PASAT, Selective Reminding test, Rey Figure, and Spatial Relations test were compared over a baseline and throughout the course of the treatment.

Clinical reports of the subject's everyday functioning were recorded pre and post treatment.

The findings for the subject were displayed graphically using a multiple baseline across cognitive measures. The ordinate on the graph depicts dependent measure changes. The abscissa corresponds to weeks of training with a heavy line separating the baseline period from the treatment period. Each dependent measure is graphed separately.

All of the dependent measures, except the functional assessments, have known standard deviations. Clinically significant changes are evident from observation of the trends in the scores. Visual inspection is considered an acceptable measure of clinical significance in single subject designs, if there are available norms (Kazdin, 1984). Wilson (1987) further suggests that in single case designs, if statistics are needed to determine whether intervention is effective, then clinical significance is unlikely to have occurred.

Methodological Assumptions

Certain assumptions have been made and include the following:

1. We are re-training the skill of attention through the treatment and not seeing improvement because of the effect of trainer attention and the subject's desire to please. The baseline data provide an indication that trainer attention

did not result in significant improvement of attention without the re-training.

2. Changes in functional level are a result of the training, not an unknown confounding variable. The client reported on his general life situation at each appointment, prior to treatment.

3. The improvement is not a result of practice effects and test familiarity. The Spatial Relations test is administered equally as often as the other measures and practice effects do not emerge. Two forms of the Selective Reminding test were administered to reduce practice effect.

Limitations

Only one cognitive behaviour was trained. Therefore, there is no opportunity to see the effects of a reversal in training another cognitive behaviour on attention.

A baseline of two discrete points is the minimal acceptable level for a single subject design (Barlow & Hersen, 1984). Although the scores generally reflect no or little change over this time period, it is a weakness in the design.

Only one subject completed the re-training program in its entirety. Therefore, there was no lateral replication to suggest generalizability. The study had time limits which did not allow for longitudinal data demonstrating maintenance of improvements in attention over time.

Summary

The study was a single-case experimental design using a multiple baseline approach on a single subject with schizophrenia. A battery of neurocognitive tests was used to gather pre, during, and post treatment data. The treatment protocol used was the Attention Process Training kit developed by Sohlberg and Mateer(1986). Methodological assumptions and limitations were reviewed.

The next chapter will present the results of the intervention.

CHAPTER IV

FINDINGS

In this chapter the results of the study are presented. All dependent measures are graphed. Qualitative reports from significant others in the subject's living, learning and working environments are described. The final section presents the research testing of the hypotheses.

Dependent Measures of Attention

Data for each measure are presented in four vertically oriented graphs. The ordinate on the top graph (Figure 2) represents PASAT scores converted to z-scores. On the second graph (Figure 3), the ordinate represents the z-scores for the Rey Complex Figure. The third graph (Figure 4) presents the Selective Reminding task raw scores. The final graph (Figure 5) is the raw scores for the Spatial Relations subtest. The abscissa on all graphs corresponds to weeks of baseline and treatment (lower scale) and the specific component of the attention re-training (upper scale).

PASAT Results

On the first baseline measure, the subject's ability to perform a serial addition task was ranked in the bottom ten per cent of the population when compared to normals. Repeated administration during the baseline period indicated

that the subject was unable to improve his performance compared to normals who do much better at the second administration of the task ($z=-2.7$, $p<.003$).

Following the initiation of treatment, PASAT scores increased to the norm from two standard deviations below the norm. This demonstrates a dramatic increase in rate of information processing as measured by the PASAT following specific attention training.

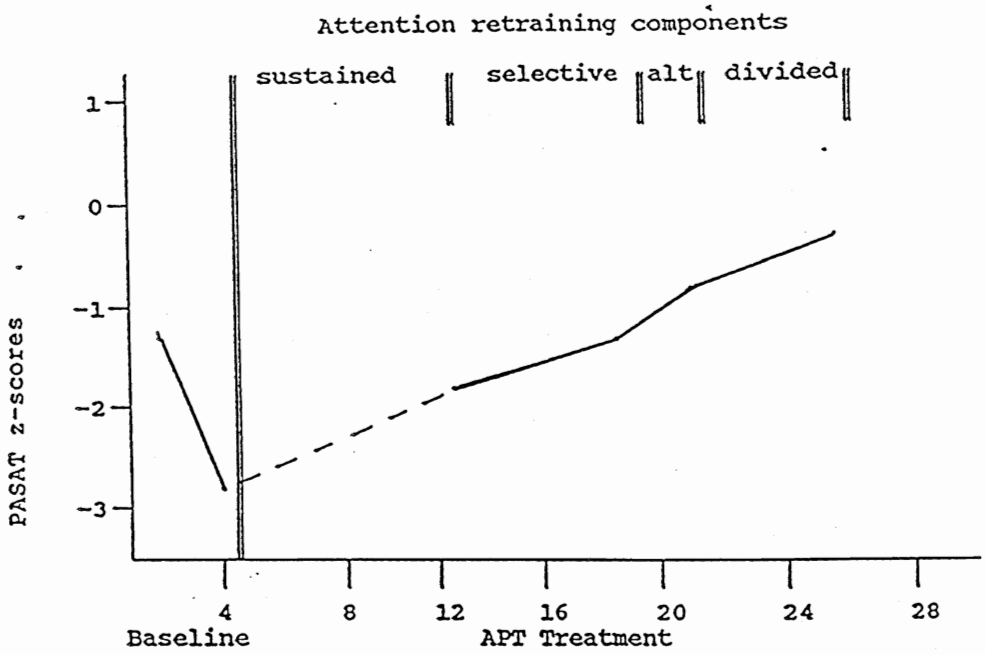
Rey Complex Figure Results

Only one baseline measure of this test was taken, as it was given with the Halstead-Reitan Test Battery. It is, therefore, difficult to assume repeated measures reflect the re-training. Nevertheless, there is a striking increase from pre to post measures of four standard deviations.

Selective Reminding Task Results

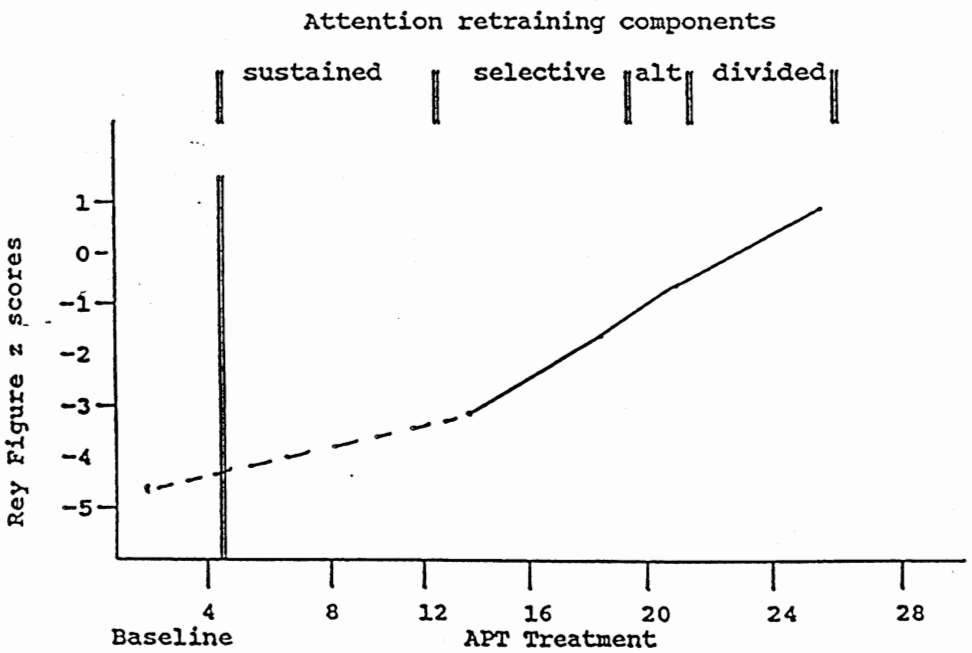
Data for graph three indicate a variance in improvement dependent on the form of the task used. Alternate forms have been found to be equivalent in the normal population (Hannay & Levin, 1986). However, one subject may have a preference for one form over another. Both forms demonstrated improvement from the baseline period with the attentional re-training. Form 2 consistently scored higher than Form 3. Nevertheless, both forms score close to or above the mean for normals and well above the mean for schizophrenics. The subject also demonstrated improvement in the recognition component of the task. The baseline scores for recognition

Figure 2 Results of attention training on PASAT scores



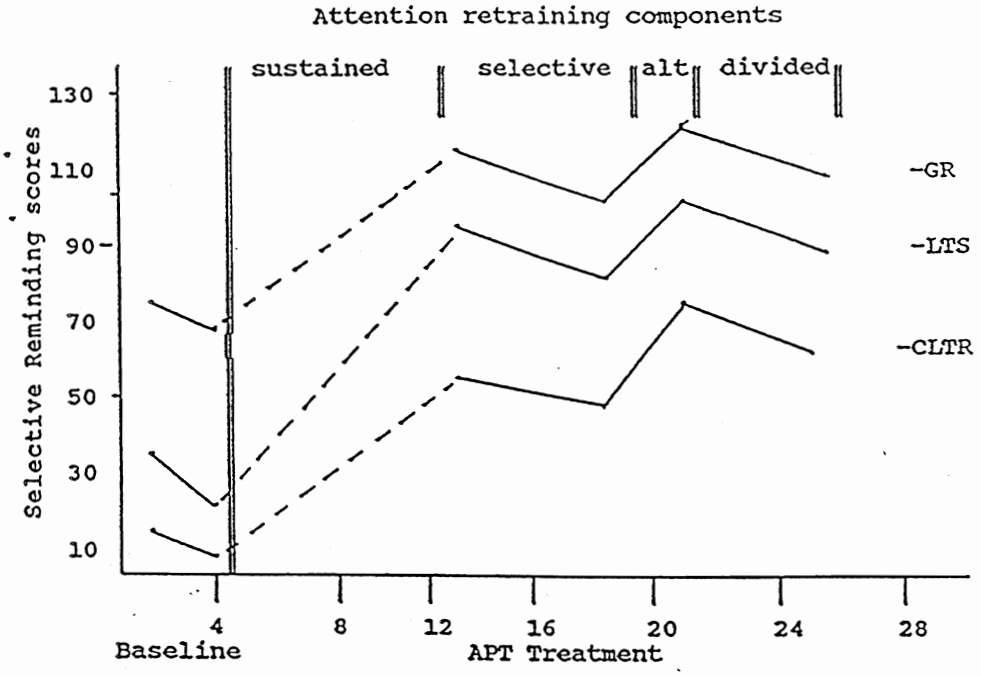
Subject's PASAT scores during baseline and thrqughout treatment.

Figure 3 Results of attention training on Rey Figure scores



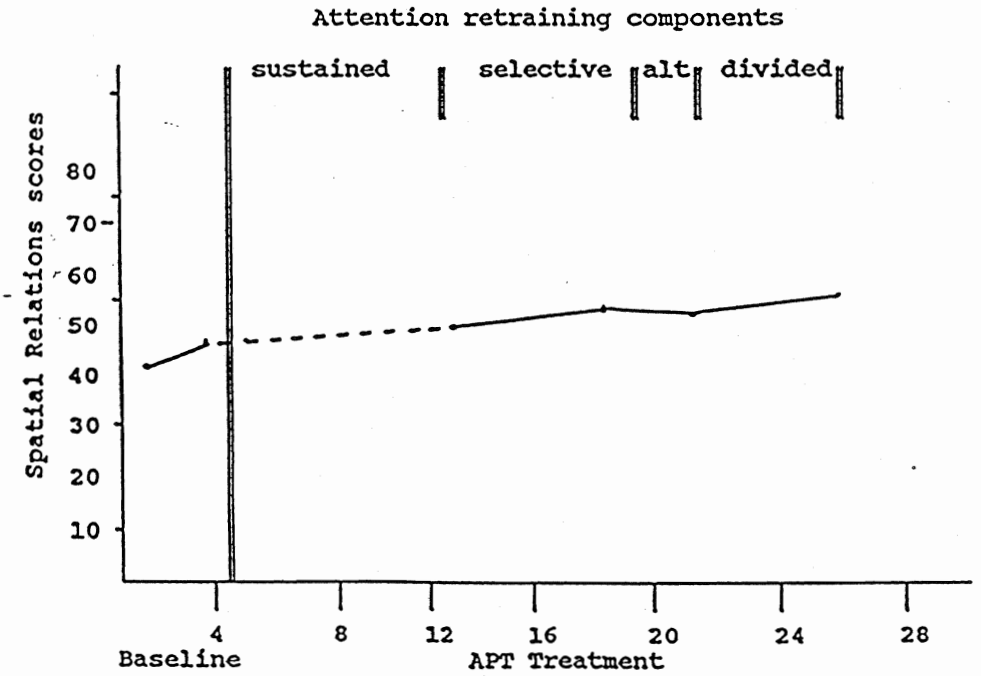
Subject's Rey Figure scores during baseline and throughout treatment.

Figure 4 Results of attention training on Selective Reminding Task scores



Subject's Selective Reminding Task scores during baseline and throughout treatment.
GR - Grand Recall
LTS - Long Term Storage
CLTR - Consistent Longterm Recall

Figure 5 Results of attention training on Spatial Relation subtest scores



Subject's Spatial Relations subtest scores during baseline and throughout treatment.

error (converted to z-scores) were $z = -4.73$, $p<.001$. Following completion of the first section of re-training, sustained attention, his z-score increased to $z = .52$. This level was then maintained throughout the rest of the re-training.

Spatial Relations Subtest Results

The graph indicates a minimal upward improvement over the course of the baseline and treatment.

By examining the graphs, it is evident that following the initiation of treatment, the subject demonstrated an noticeable increase in test scores on all attention tests and minimal increase in scores on the Spatial Relations Test.

Information Processing Measure

The Halstead-Reitan Test Battery was given pre and post treatment. Scores from attention and memory subtests are presented and compared, to suggest an overall improvement in information processing as a result of the attention re-training (see Table 1).

There was a variation in performance on the specific tests. There was no improvement between pre and post testing on the Seashore Rhythm Test. In fact, there was a slight decrease in performance on this test. However, the Speech Sounds Perception Test demonstrated an improvement in test scores although it is minimal. The scores remain in the normal range. The Trail Making Test showed improvement in

Table 1

Information Processing, Memory and Intelligence Scores

	Early testing	Pre-training	Post-training
HALSTEAD REITAN BATTERY	Nov. 1987	March 1990	Sept. 1990
Seashore Rhythm Test			
errors	6	4	5
ranked score	8	5	6
Speech Sounds Perception Test errors	10	8	6
Trail Making Test Part A	35"	41"	28"
errors	1	0	0
Part B	95"	94"	61"
errors	1	0	0
WESCHLER MEMORY SCALE			
Information	6	6	5
Orientation	5	5	5
Mental Control	6	5	9
Memory Passages	4.5	5.5	8
Digits Total	10	11	14
Vis. Reprod.	9	9	13
Associate Lng.	14	12.5	17
Total Raw Score	54.5	54	71
Age Corrections	34	34	34
Corrected Score	88.5	88	105
MQ	87	86 *	112 **
SHIPLEY I.Q.	100		103

* Weschler Memory Scale: z = -2.33
** Weschler Memory Scale: z = 1.68

time and errors. Particularly, the Trails B showed a change from the impaired range (88 seconds or longer) to well within the normal range. Perhaps the most significant change was in the scores on the Weschler Memory Scale. Prior to treatment, the subject's scores were more than two standard deviations below the mean ($z= -2.33$, $p<.009$). Following treatment, performance dramatically improved to almost two standard deviations above the mean ($z= 1.68$, $p<.04$). It is very unlikely such a significant change would be due to anything other than the treatment.

The HRNTB had also been completed by the subject two years prior to this study. Scores between this assessment and the pre training measure demonstrate no discernible change although the client was involved in a psychosocial rehabilitation program. This indicates the improvement over the course of the training is a result of the re-training rather than any psychosocial intervention.

Functional Assessment: Qualitative Data

The subject is a twenty-six year old single male of Italian descent. At the time of entry into the study, he was living in his own apartment but returning to his family home at least once and as much as two to three times per week. The clinical record indicates he has a diagnosis of schizophrenia and a psychiatric history dating back to 1982.

His mental status report from the clinical record indicate no reported symptoms, impaired judgement in family

issues, and an inability to think abstractly. His mood was good and his affect bright. He did complain of having poor concentration and he identified this as being a long-standing problem.

The subject was involved in a co-operative work program at the local community college. He was working in a greenhouse three half-days per week prior to entry into the study and maintained this job throughout the course of the study. The school reported he had difficulties at his previous work placement as he did not attend to multi-level instructions well. This, in turn, caused him to be highly anxious about work performance.

Prior to training (week three of the baseline period) the investigator met with the subject's immediate supervisor at the greenhouse. The supervisor was very positive about the subject's motivation and his work habits. However, he did have two primary concerns about the subject's work performance. The first was an apparent inability to retain and act on multistep instructions. The subject had to be given one-step instructions and return to the supervisor on a regular basis to get further instructions. The second concern was in regard to the subject's social skills at coffee breaks and lunch times. He had a tendency to go off on a tangent within the conversation, or, at times, he responded to a small part of a larger conversation and this was perceived by his co-workers as intrusive and odd. He

lacked awareness of appropriate social topics at work.

The supervisor reports, following training, a marked improvement in the subject's ability to retain instructions. He has been employed by the employer, not the co-operative work program, since June, 1990. He is now responsible for an entire greenhouse. The employer would like him to work full-time hours. However, the subject feels that would still be too stressful for him. He currently is working a five-day, four-hour-per-day, week.

The author also met with the subject's parents. They described him as not recognizing the lack of quality in some of the tasks he did around the home. For example, he painted the living room but missed edges and applied paint unevenly. He did not seem aware of these problems. The parents did report there were no obvious problems with gross motor tasks such as lawn mowing. The parents also described the subject as being unable to be with large groups of people socially. He would withdraw mentally from the conversations and then enter completely off topic or off on a tangent.

Following the completion of the re-training, the subject's parents reported an increase in energy, motivation and confidence. The subject is much more optimistic and hopeful in conversation. He is also more self-directed in activity. For example, he initiates and completes chores without being asked. He also has expressed an interest in re-doing some renovations he had done previously. His father

states that they would not have asked him to do this for fear of hurting his feelings prior to the treatment and the subject did not appear to notice the poor quality of the work until now. The parents also report a general reduction in anxiety in social conversation but there are still tangential comments. Parents did say perhaps this was a result of their concern about him and if he did not have the illness they may not pay such close attention.

Reports from other significant people were obtained over the course of the study.

1) The occupational therapist conducting the living skills and problem solving groups at the subject's apartment building reported a positive change in his assertiveness and self-confidence in the group. He also demonstrated the ability to manage positive and negative feedback from other group members and made an improvement in sticking to the topic being discussed. He does continue to demonstrate minimal acceptable standards in grooming and clothing and, at times, poor social awareness.

2) His case manager did not report any changes in the individual case management sessions. She did report that the subject would tell her he felt more hopeful about the future. He identified that he always had problems with attention and concentration but had not had any direct intervention for these problems. He stated he was grateful for a specific treatment for these problems. He also was

proud of the opportunity to be a part of the study in an altruistic sense ("Maybe it will help other people with the illness"). He did report to his case manager some concern about the amount of time he had to invest in the re-training and the number of times he had to come to the office each week.

3) The trainer reports that, during the training, some days the subject could not participate in the training due to high stress levels resulting from preoccupation with work or family concerns. This reflects the necessity for living, learning and working conditions to be as stable as life allows during the re-training. In general, the subject was very motivated and appeared to enjoy the challenge of the hierarchy of the tests.

The subject, himself, reports that he notices a significant improvement in his ability to read and retain information from school books. He also states he feels more self-confident. He states the re-training itself was time consuming and stressful for him but worth it.

Treatment Observations

The subject was motivated and excited about participating in the study. He rarely missed a treatment session. He was able to tolerate one hour sessions if the tasks were changed throughout the treatment period.

Some common themes emerged during the re-training.

These included the following: Outside stress from work, friends or family, was tolerated reasonably well; however, there were some days, immediately following a week-end home or family engagement, where the subject was completely unable to participate in the re-training; the subject demonstrated a slow reaction time on audiotapes when he was required to press a buzzer when he heard a certain stimulus. He would compensate for this by using his memory and verbally reporting the correct score; an investigation of the attention strategies which the subject used identified primarily retrospective strategies. That is, the subject was always waiting to compare the stimulus with the one previously heard and then pressed the buzzer. A prospective strategy was taught whereby the correct response was anticipated by the subject and he pressed the buzzer when the auditory cue matched the anticipated response; visual cues did not increase his attention but using a focal point or closing his eyes increased his performance in the auditory re-training; the subject's anxiety, particularly on timed tasks, interfered with his attention. Stopwatch use and timing were, therefore, done as unobtrusively as possible and the subject was encouraged to disregard them.

Thus, teaching prospective strategies, use of focal points, decreasing visual stimuli, and decreasing consciousness of performance all appeared to assist in improving performance on the attention tasks.

Very early in the re-training, the subject indicated an awareness, which he did not have before, of his owattention. He described that he "knew" when his brain was paying attention or not. His awareness of what attention was, for him, appeared to give him confidence as tasks increased in complexity. It would seem this is an indication the cognitive process was stressed by the re-training.

Hypotheses Testing

Hypothesis One: The subject will demonstrate an increase in scores on attention measures (PASAT, Selective Reminding Test, Rey Figure), indicating an improvement in attentional ability compared to baseline levels.

The PASAT scores increased two standard deviations to the norm. The scores on the Selective Reminding Test increased 20-30 points, depending on the form used, to the norm. The accuracy scores on the Rey Figure increased four standard deviations to the norm. The subject demonstrated an increase in scores on all attention measures. The results support the hypothesis.

Hypothesis Two: The subject will demonstrate an increase in the attention and memory subtests of the HRNTB, indicating an improvement in information processing ability, compared to pre-treatment scores.

Tests demonstrating improvement are the Speech Sounds

Perception Test, the Trail Making Test, and the Weschler Memory Scale. The Seashore Rhythm Test showed a slightdeterioration.

The subject demonstrated an increase in scores on the majority of the attention and memory subtests. The results partially support the hypothesis.

Hypothesis Three: Clinical reports of level of functioning will demonstrate improvement in the subject's living, learning and working environments compared to pre-training reports.

In general, parents, employer and significant others report qualitative data suggesting improvements in retaining and following instructions, social conversation skills and self-confidence. The results support the hypothesis.

Hypothesis Four: There will be no improvements on the Spatial Relations subtest compared to baseline indicating attention re-training will not produce significant changes in other cognitive abilities.

Over the course of the study the scores for the Spatial Relations subtest demonstrated a slight improvement. The results partially support the hypothesis.

Conclusion

The analysis of the data demonstrates support of all

four hypotheses: through visual inspection of raw and z-scores graphed for dependent measures over weeks of baselineand re-training; through improved scores on the majority of the overall information processing tests; and through subjective reports of significant others and the subject, himself. The implications of these findings will be discussed further in chapter five.

CHAPTER V

DISCUSSION

The previous chapters included an introduction to the problem, a review of the related literature, the methodology employed in the study, and the findings. This chapter presents a summary and a discussion of the findings as they pertain to the related literature. It also includes discussion of the implications of the findings and conclusions that can be reached from the results. Recommendations and implications for the theory, further research, and practice are addressed.

The purpose of the study was to ascertain the efficacy of cognitive re-training of attentional deficits on a client with schizophrenia, utilizing the techniques used in the acquired brain-injured population. The results suggest re-training of attention deficits, for this subject, using these techniques, is effective.

Summary

The review of the related literature indicated that attentional deficits in schizophrenia impact on a person's ability to function adequately in his/her living, learning, and working environments. Traditional intervention has been

geared toward assisting clients in coping with, or compensating for, their attentional deficits. Some authors (Yozawitz, 1985; Diamant, 1986) have attempted to intervene, at the level of impairment, in treating the cognitive deficit, with some successs. However, the results are compromised by methodological difficulties. Within the brain-injured field, Sohlberg and Mateer (1987) suggest it is possible to train specific cognitive processes. Because there are many similarities in cognitive deficits between the two populations, the theoretical basis chosen for this study is the model of clinical attention and Process Specific Approach of Sohlberg and Mateer (1989).

The research design was a single-case experimental design utilizing multiple assessments over a four-week baseline period, prior to the introduction of treatment. The treatment was administered over a period of twenty-four weeks and this time duration was unique to the subject's ability to reach criterion on each task in each section of the attention re-training.

The results indicate a significant improvement in all dependent measures of attention and memory, and a minimal improvement in the untrained cognitive process of spatial relations. Positive reports by significant others also indicate the subject made gains in his ability to function in his living, learning, and working environments.

Discussion

The subject presented with moderate to severe attention deficits in the pre testing and baseline period of the study. The subject's increased scores on all attentional tests indicate attention skills increased to within normal limits. These results demonstrate the potential for improvement of attentional deficits, for this subject, given specific attention re-training. Results also support the effectiveness of the attention training model of Sohlberg and Mateer(1989) outlined in this study, for this subject.

It is difficult to identify the effect of which, if any, of the individual components of the re-training were most effective. The greatest shift between scores for the PASAT was between the final baseline measure and the end of section one, sustained attention training. However, scores on the PASAT continue to improve throughout all sections. Conversely, the Rey Figure scores rise uniformly following the completion of each section. The Selective Reminding Task scores vary with which form was used, but the relationship for each form is a positive linear one. It would appear the necessity for using many measures of attention and memory, as recommended by Lezak (1983), is reflected in these results.

The Process Specific Approach to remediation assumes treatment can impact on distinct cognitive areas. In this study, treatment was directed towards attentional deficits.

Although there is a slight improvement in other cognitive areas (ie., spatial relations), only the attention and memory tests demonstrate significant improvement. These results appear to support the use of the Process Specific Approach with a subject with schizophrenia.

The attention tests, with the exception of the PASAT, do not necessarily correlate with improved functional skills. Nevertheless, the subject did demonstrate functional gains in his living, learning, and working environments during the time he was being trained. Although it is not possible to rule out other possible explanations for this improvement in the subject's general functional status, the results suggest improvement in attention skills positively impact on the subject's quality of life.

Along this same general theme, Gordon (1987) describes three levels of therapy generalization:

Level 1: At the most basic level, remediation results should generalize from one session to another and to alternate forms of the same training materials. In this study, the subject's accuracy score on any given task increased over the repeated administration of the task and use of coaching strategies to 100% accuracy.

Level 2: A higher level of generalization is evident when neuropsychological tasks containing similar cognitive skills, but different task demands, demonstrate improvement. In this study, the subject consistently increased his scores

in attention and memory measures following the baseline period.

Level 3: The highest level of generalization is evident when cognitive skills gained in the treatment sessions result in improved performance in the subject's everyday environments. Observation of functioning in real world tasks provides a qualitative functional indicator of progress. In this study, the significant others in the subject's environment consistently reported their perception of improved functioning in his everyday environments.

Sohlberg and Mateer(1989) also suggest that for re-training to be effective, improvement must be reflected in the subject's functioning ability at home, work, and in social situations.

Another interesting outcome is the relationship between attention re-training and improved memory scores. The subject was specifically trained in attention. However, he demonstrates significant improvement on the Weschler Memory Scale and the Selective Reminding Test, which is a verbal memory test. One explanation for this is that attention difficulties may be the basis for memory problems. This result is also supported by Sohlberg and Mateer (1989). They suggest attention is a potential factor underlying memory problems. Their data indicate increased attentional ability often results in improved memory. These results support and confirm that memory problems, if related to attention

disorders, may be treatable through attention re-training.

Limitations of the Findings

The results must be considered within the limitations of this study. The design did not include a measure or re-training of a second cognitive process. This reduces the baseline control of trainer attention as a confounding variable. The Rey Figure was not administered more than once in the baseline period because it was administered with the HRNTB and to reduce practice effect. This, however, does not allow assumptions to be made about the effects of treatment. That is, without two discrete baseline points showing little or negative variation, it cannot be assumed the training itself resulted in the test scores.

The study had time limitations which did not allow for longitudinal data regarding the maintenance of attention over time. Time restrictions also prevented the completion of the second subject which would have strengthened the design through lateral replication.

A total of six measures over time were taken of the PASAT, the Selective Reminding Test and the Spatial Relations test. Five measures of the Rey Figure were taken. This is a minimal number of measures for a single-case design in that variations during treatment may not be as evident. The likelihood of a practice effect is accounted for by having a reduced number of measures.

No conclusions can be made from this study about the generalizability of the treatment to other clients with schizophrenia because it is a single-subject design.

The design, itself, is an A-B design. This is the simplest of experimental strategies whereby changes in the dependent variable are attributed to the effects of the treatment. There are some important reservations to this causality. It is not possible to judge what the natural course of the behaviour would be, without intervention, as a result of history or an unknown confounding variable. Although strategies were followed to prevent these threats, a statement can only be made that in all likelihood, the treatment produced the improvements in attention. One cannot categorically state the treatment is the cause of the improvement.

It was not possible to withdraw the treatment to assess whether the improvement diminishes as the re-training was of the actual deficit as opposed to a behaviour. This design may not permit a definitive answer that treatment is the effective ingredient of change, but it is a design that can be readily carried out in an out-patient facility with a minimum of difficulty and with no harm being done to the patient. From a clinical standpoint, it was possible to obtain some objective estimate of the treatment's success, and the results of this study can prompt further investigation into the effects of the treatment on other

schizophrenic subjects.

Implications for Theory

The Process Specific Approach suggests that direct re-training of cognitive processes can result in a re-organization of higher level thought processes. Repeated taxing of the same neurological system facilitates and guides the re-organization of function. The approach requires implementation of repetitive exercises, within a planned program, that places demands on the patient to perform an impaired skill (Sohlberg & Mateer, 1989).

The theory does not discriminate between cognitive deficits as a result of brain injury or psychiatric illness, although these techniques are used predominately with the brain injured. Some authors (Yozawitz, 1986; Erickson, 1982; Diamant, 1985) have suggested using the knowledge available from cognitive remediation of the brain injured for clients with chronic, long-term, psychiatric illnesses with concommitant cognitive deficits.

The theory proposes that intervention can be effective at the biological level (at the level of impairment): that taxing of a specific neurological process will result in an acquisition of a cognitive skill. The results of this study support this approach and suggest that, for this subject, the approach is effective. It further implies the possibility that intervention can be made at the level of impairment to

reduce disability and handicap for some people with schizophrenia. It broadens the theory to include the potential for effectiveness in this population. If, in fact, there is a brain impairment as suggested by Suddath et al. (1990), this approach would have potential for the treament of these cognitive deficits.

Implications for Research and Practice

The implications of the findings for further research and practice are evident. In order to establish generalizability of the findings, multiple replications must be completed. Barlow and Hersen (1984) suggest four to six subjects, within the same setting, demonstrating significant results, are sufficient to confirm generalizability in that setting. The next step would be to do multiple replications of four to six subjects in different settings. If these subjects demonstrate similar improvements, generalizability to the population is established. Again, the individual course and nature of the illness and the specific cognitive deficits of each subject must be taken into consideration. Even if generalizability is validated, it is possible the treatment may be too stressful or not effective for some clients with schizophrenia.

Further research should include treatments across cognitive behaviours and include longitudinal data on retention of attention skills. It is not clear from this

study if the re-training of attention results in permanent acquisition of that cognitive process or if maintenance attention training must be done to preserve the skill.

The administration of the HRNTB is cumbersome and lengthy and it would appear only those subtests related to attention and memory can be included in pre and post training. Because of the possible impact on memory as a result of the attention re-training, inclusion of the Weschler Memory Scale is essential.

In practice, clients with schizophrenia who have attention and memory deficits, may benefit from re-training using these techniques. Because the deficits have a major impact on the clients' ability to live, learn and work in the environment of their choice, the treatment of these deficits may result in a better quality of life.

The re-training demands are labour intensive for both the trainer and the client. The results must be significant for the total amount of training hours to be justified as a cost-effective intervention for mental health programs.

Conclusion

The results indicate that cognitive re-training for a single subject with schizophrenia and attention deficits is effective using those techniques borrowed from the brain-injured field. For this subject, the Process Specific Approach to cognitive remediation resulted in improved test

scores and functioning in his living, learning, and working environments. Further research within the same setting and across different settings is recommended to establish the generalizability of these findings.

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APPENDIX ONE

Word Lists From Forms 2 and 3 of the Selective Reminding Test.

Selective Reminding Test

Form 2	Form 3
shine	throw
disagree	lily
fat	film
wealthy	discreet
drunk	loft
pin	beef
grass	street
moon	helmet
prepare	snake
prize	dug
duck	pack
leaf	tin

APPENDIX TWO

PASAT SCORE SHEET

ID _____

Unpaced Practice: 7+2(9)__4(6)__1(5)__6(7)__9(15)__3(12)__5(8)__8(13)__
2(10)__4(6)__

Paced Practice (_____): 3+4(7)__1(5)__7(8)__2(9)__4(6)__9(13)__6(15)__
3(9)__7(10)__

Paced Test Trials:

2	1.2	1.6	2.0	2.4	1.2	1.6	2.0	2.4	1.2	1.6	2.0	2.4
7 (9)				9(11)				2 (8)				
3(10)				7(16)				7 (9)				
4 (7)				6(13)				5(12)				
8(12)				5(11)				9(14)				
1 (9)				8(13)				2(11)				
5 (6)				1 (9)				3 (5)				
6(11)				4 (5)				9(12)				
9(15)				1 (5)				7(16)				
1(10)				2 (3)				4(11)				
3 (4)				6 (8)				5 (9)				
6 (9)				3 (9)				7(12)				
4(10)				7(10)				6(13)				
3 (7)				5(12)				8(14)				
2 (5)				8(13)				1 (9)				
7 (9)				3(11)				3 (4)				
8(15)				9(12)				1 (4)				
5(13)				1(10)				9(10)				
9(14)				4 (5)				2(11)				
4(13)				8(12)				5 (7)				
2 (6)				6(14)				6(11)				

	Total Correct	Time/Response
2.4 sec pacing ( )	_____	_____
2.0 sec pacing ( )	_____	_____
1.6 sec pacing ( )	_____	_____
1.2 sec pacing ( )	_____	_____

Raw total _____ Raw Mean _____ Total Time _____ Mean Time _____

Strategies:

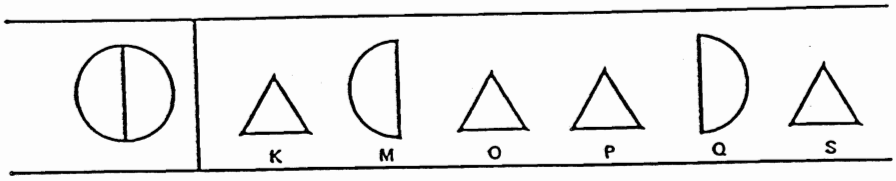
2.4 sec:

2.0 sec:

1.6 sec:

1.2 sec:

APPENDIX THREE

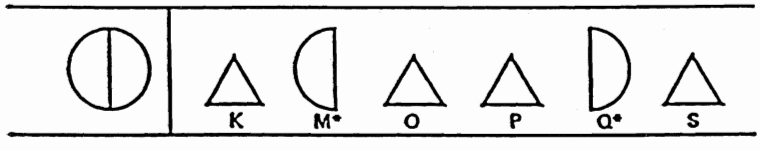


B: Error or No Response

If the subject gives an incorrect response or does not respond, point to piece "M" and piece "Q" while saying, *This piece and this piece make this* (point to the complete shape). *Now you show me the two pieces that make this* (point again to the complete shape). Explain further, if necessary, until the subject understands the task.

Tell me which of these pieces (run your finger across pieces K to S) go together to make this (point to the complete shape).

B.



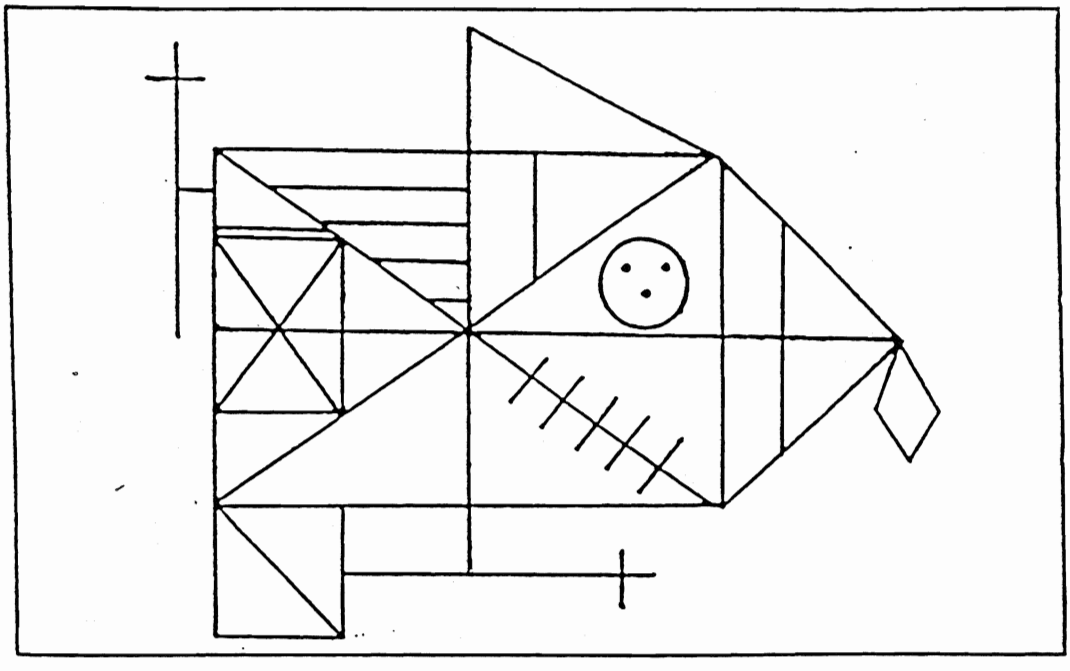
Correct: M and Q

I am going to show you some more. Work as fast as you can, without making mistakes, until I tell you to stop.

Proceed to Item 1 for all subjects.

APPENDIX FOUR

Rey Figure



APPENDIX FIVE
APT
Attention Process Training

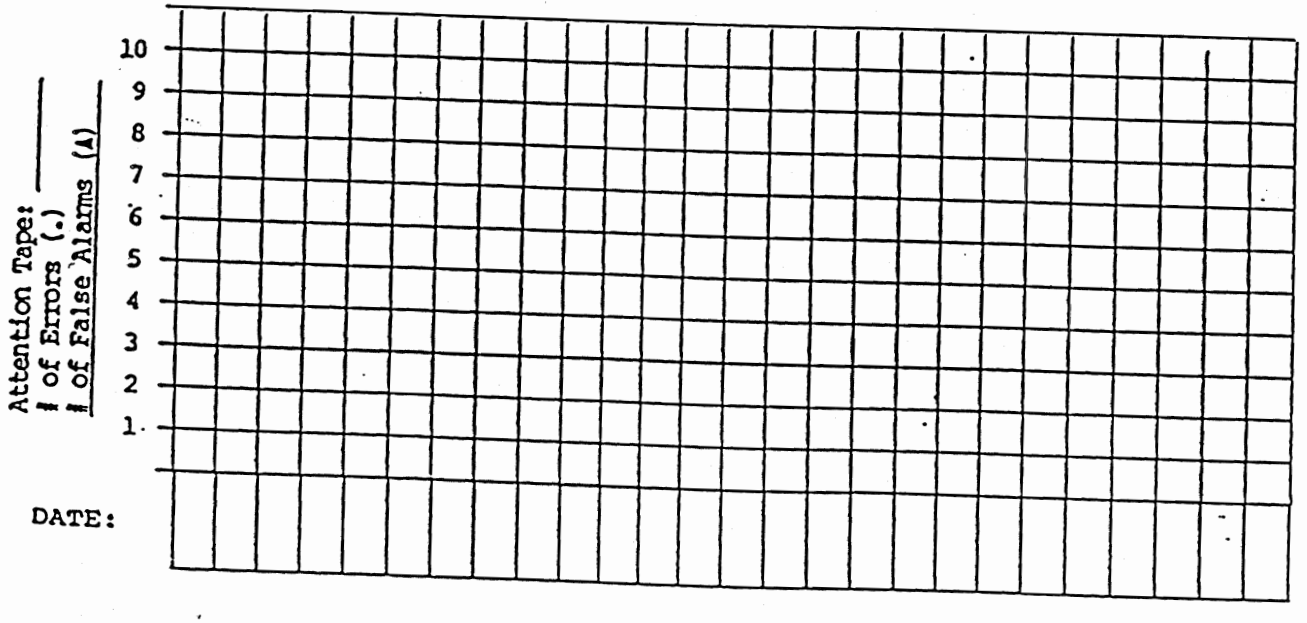
McKay Moore Sohlberg, MS & Catherine A. Mateer, PhD
CENTER FOR COGNITIVE REHABILITATION

ATTENTION TAPE SCORESHEET - R

NAME _____

TAPE/Exercise	
Date	TOTAL
# of errors:	
# of false alarms:	
Observations (error patterns):	

TAPE/Exercise	
Date	TOTAL
# of errors:	
# of false alarms:	
Observations (error patterns):	



APPENDIX SIX

Treatment Tasks Used in Attention Training

Sustained Attention

Attention Tapes 2-8: (auditorially presented strings of stimuli with response requirements of increasing difficulty)
Tape 2 - Press the buzzer each time you hear the number two -
4 7 8 2* 5 2* 6 7 2*
Tape 7 - Press the buzzer each time you hear the letter in the alphabet which is before the one you have just heard -
L P Q C B* A* Z Y* R Q*
Many tapes have both fast and slow presentations.

Serial Numbers (number manipulation exercises)
Exercise #6 - count backwards fromm 100 by 7's.

Visual tasks (shape and colour discrimination tasks/ timed)
Worksheet #2 - cross out all the yellow stars.

Selective Attention

Similar audiotapes with background noise included on the tape, visual tasks with distractor overlays.

Alternating Attention

Odd-Even Number Cancellation - First the patient crosses out the odd numbers, when the therapist says "change", the patient crosses out the even numbers.

Big-Little Task - Targets: BIG little LITTLE big BIG LITTLE
Targets are read as words, when the therapist says "change" the targets are read as size.

Divided Attention

Dual Task Performance - Patient is asked to do a visual task while listening to and doing an auditory tape.

APPENDIX SEVEN

Interview Questions (Parents)

Pre-training interview:

1. How often does _____ come home?

2. When he is at home what does he do?

   a) Does he help with chores?

   b) If so, describe what he does and what you think about how well he does it.

3. Can you tell me how you think his attention is?

4. Can you describe some tasks he's done and what the results have been?

5. What are your concerns about him?

6. What are your concerns about his ability to perform, to function effectively?

7. Describe how he interacts with other people.

8. Does he ever appear to have difficulty concentrating or remembering?

9. What does he do well? What are you satisfied with?

10. What do you hope for him in the future?

Post-training interview:

1. Have you noticed any changes in _____ behaviour or performance tasks?

2. Same questions as pre-training interview.

APPENDIX EIGHT

Interview Questions (Employer)

Pre-training interview:

1. How long has _____ been working for you?

2. What kind of worker is he?

   a) What does he do well?

   b) What concerns do you have?

3. What do you think of his attention

   a) to instructions?

   b) to details?

   c) to customers/staff?

4. Would you employ him? If yes, how many hours?

5. What would you like to see him improve in as far as his work habits, work skills or work personality go?

Post-training interview:

The same questions with the exception of question #4 which was changed to 4) How many hours/week would you like _____ to work?

Would you like to see him continuing here indefinitely?

Significant others (informally asked) if any,

1. Have you noticed any changes in _____? Describe them for me.

APPENDIX NINE

CONSENT FORM

I agree to participate in a research study to assess the effectiveness of a treatment technique for clients who have problems with attention and concentration.

I understand my involvement will include neuropsychological testing at the beginning and end of the retraining period. This will take approximately five hours to complete. Ongoing short attention tests will be done over the initial assessment and treatment periods. These tests will be 10 - 15 minutes in length.

The treatment will consist of three one half to three quarter hour sessions, weekly over a 3 - 4 month period. I understand I will be doing paper and pencil tasks and listening to tapes in order to train my attention and concentration skills. Important people in my life at home, work, or school programs will be interviewed.

I understand that the retraining may be helpful in improving my thinking abilities. There is a slight possibility the testing and retraining may be stressful for me. If this occurs I will have the opportunity to talk about my concerns with my case manager or the study investigator. I understand the results of the re-training will be shared with the treatment team.

I understand that the results of the study will be treated in a confidential manner. In any scientific presentation or publication that may arise out of the study, there will be absolutely no disclosure of any information which identifies me personally. I willingly agree to participate and I realize that I can stop my participation in the study at any time without in any way affecting my treatment.

Signature:_____

Name:_____

Date:_____

Witness:_____

For information or questions call: Joyce Tryssenaar 525-2832